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ABSTRACT

Of the major professional groups, there is probably none that is as undertrained as teachers. For this reason, teachers and administrators will be responsive to relevant, superior training, especially if it helps them to perform with a greater competence and sense of achievement. A quantum jump can probably be made in the use of technology if the on-the-cheap approach to the training of teachers is abandoned. In a sense, teacher educators, administrators and classroom teachers are so hungry for ways to improve their professional skills, that they could be captured by relevant professional training programs. This paper purports to offer strategies and concrete suggestions to improve preservice and inservice training, so that educators acquire new competencies relating to instructional television. It takes it for granted that technology improves teaching, and that instructional technology of high caliber will be available and easily accessible to teachers and administrators. (Author/GO)

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# TEACHER TRAINING IN INSTRUCTIONAL TECHNOLOGY

By Kevin Ryan*

Eight years ago, in his book The Schools, Martin Mayer wrote:

> There are a million and a quarter classroom teachers, and by the normal curve of distribution, most of them are not especially talented. It was observed some years ago that most steel workers are not especially talented either -- but they all turn out pretty good steel. The steel industry has developed technology that enables routine operatives to perform satisfactory work. The schools appear to be trapped in a technology that can be employed successfully only by good teachers.[1] (p.384, The Schools, Harper & Brothers, New York 1961.)

During the intervening years, the number of classroom teachers has grown to two millions, but changes in their understanding and use of technology are not evident. It is the intention of this paper to deal with the question of how teachers and administrators can gain a more sophisticated understanding of instructional technology. Further, it will offer strategies and concrete suggestions to improve pre-service and in-service training, so that teachers and administrators acquire new competencies relating to instructional technology. This paper, however, is based on two assumptions. First, instructional technology of the more advanced type (television, data retrieval systems, audio- and video-tape recorders, film projectors) can be useful in the instruction of children. Even more, these newer means of instruction present the opportunity of a major improvement in the quality of education. Second, instructional technology of high caliber (both hardware and software) will not only be available, but also made easily accessible to teachers and administrators. At issue, in this paper, then, is not whether or not the more advanced types of educational

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[1] M. Mayer, The Schools, p. 384.

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technology are a good, or when and how they should be made available, but how teachers and administrators can make advanced instructional technology a routine and systematic part of what they are doing. It should be stressed, however, that training in the use of the new technologies should not proceed until material of high caliber is made easily available to teachers and administrators. To do otherwise would only deepen the cynicism and disappointment which school personnel already have for this subject.

A word or two should be said about the nature of the problem. Why is it that teachers and administrators do not use very sophisticated educational technology. For one thing, the use of technology is not part of the teacher image. When most of us think of teaching, we think of an individual using his mind and his voice box to present words to eardrums and, hopefully, the minds of others. This is the kind of teaching that most teachers have been exposed to from kindergarden on up. This is true, also, for their experience in teacher training. While most have had some formal instruction in audio-visual aids, and have become convinced that they can improve their teaching performance, this training rarely has strong transfer to the classroom. Most young teachers have experiences similar to the following: The newly certified teacher begins a professional career believing in many educational ideas, such as the value of using audio-visual aids, individualizing instruction and teaching non-authoritarian ways. However, the existential demands of teaching between five and seven hours a day take their toll. The teacher has little time for the carefu. planning for behavioral objectives, let alone for audio-visual materials which will help in the achievement of those objectives. All too often when the teacher discovers a film or record which does fit well into a lesson, he cannot get his hands on it at the right time. The system for obtaining films and records and

other "content" can be quite cumbersome. Also, the maintenance of the hardware is a frequent source of disappointment and frustration. As a result of all these factors -- the teacher image, professional training in education, the daily demands of teaching and the present systems for using technology -- the level of educational technology in the schools is rather primitive.

## THE NECESSARY UNDERSTANDING

Before any fundamental change in the behavior of teachers or administrators will be made, they must have a much more sophisticated understanding of educational technology. Understanding is not enough, but it is the first step. Since the term "understanding" is an abstraction, it is important that I specify in some detail the nature of this understanding.[2]

### The Meaning Of The Machine

In the education of teachers for the efficient and routine use of technology, the basic problem of instruction is the development of a concept of the machine itself above and beyond its educational function. Machines have certain generalized characteristics, and a broad appreciation of these generalized charateristics is pre-requisite to any specific training in the use of the machine.

One of the basic criteria for the anthropological description of species Homo Sapiens has been the ability of man to use tools. Man, in his base wisdom, is a tool user, and to trace the history of tools is a reliable index to the development of cultural complexity.

The tool, though, is much more than it appears to be at first glance. Whether we speak of the most primitive hand axe or the most complex computer imaginable, they share common characteristics which define their nature, delineate a function, and instruct in usage. And, by the analysis of tool usage, one can

[2] I am indebted for the development of this concept and other contributions to this paper to William Guelcher. Mr. Guelcher is a Staff Associate in the Department of Education at The University of Chicago and a distinguished teacher with national recognition.

generate an over-view of technology which helps to comprehend the problems of systematic thought.

First, a tool represents some way of basically standardizing behavior, although in varying degrees. Very simple tools such as the primitive hand axe modify behavior in general terms; the axe is little more than a crude extension of the closed fist, and the axe is generally used to perform those functions which the closed fist earlier performed. As the hand axe took on a sharp edge and a handle through technological development, so the behavior associated with the tool was modified and specialized. The "new" axe was meant to be swung, and this is a much more learned, specialized behavior as compared to the unspecific nature of the earlier hand axe.

But, compare the early hand axe to a tool as "complex" as the brace-and-bit-type drill. The appropriate behavior for the proper use of a brace and bit is much more highly sophisticated than behavior dictated by the axe, and this is a comparative demonstration of the degree to which a tool disciplines by complexity of operation. The lathe is much more complex than the brace and bit, and so on up the ladder of complex machines. So, the machine, any machine, has a certain behavior built into it as a discipline through its operating principles, and the major output of the machine process is standardization.

Standardization is a highly complex term, but simply considered, standardization is regularity or routine. The "randomness" of raw materials are fed into a machine, and they are re-ordered according to plan and design. Parts are rearranged and shaped; idealized configurations are sought and rendered through the inner processes of the machine, and in the end, machines transform nature's chance production into standardized reproduction. This means, of course, that the whole process of making can be rationalized according to plan -- idealized

wishes are transformed to purpose, purpose to machine processes, and processes to regularity of output, regular to a point of almost total predictability of ends.

So, in the last analysis, the machine is an expression of rational purpose, and technology is the logic underlying the structure of man's aspirations for transforming the material world of random shapes and functions into purposeful shapes and functions. Technology gives mute testimony to a rank order of problem solving, broad goals (transforming nature), direct purpose (definition of problem), specific objective (development of specialized operations), and concrete processes (the actual dynamics of reassembling the material from random to rational).

Comparing the hand axe to the computer reveals another point of similarity: both deal in a sense of abstraction. The abstraction is present the moment that a man-ape sees in his "monkey tool" a residual purpose which can influence events which have not yet happened. The reality of the present is converted into the abstraction of the future. The level of abstraction may be very low, but it does express a relationship between the immediate and the intended. The tool itself becomes purposeful rather than random. The computer, on the other hand, works almost totally in the abstract. Only to the extent that electrical pulses can be made to resemble something in reality does the computer touch the world of "things." But the "business" of the computer is the business of relationships of pure abstraction. In the realm of relationship, it never directly senses the pressure of a man's body calling it into action, nor does it ever experience directly the people for whom it makes so many decisions. Yet, though the computer's idiom is pure relationship and its language is the language of logic, it belongs to the same family as the hand axe. They represent extremes on

the same continuum. Both use the same components, only in far different measure and at great distances in sophistication. Both represent discipline, but in different measure. Both represent decision making, but in different measure. Technology, then, means establishing the precise nature of conceived relationship.

## EDUCATION AND TECHNOLOGY: Use vs. Operation

The present relationship between public education and technology is incomplete, and the role of technology in education is poorly understood. The usual university course in educational technology requires one to learn how to operate a group of audio-visual devices. Threading a projector, operating a tape recorder, or making an overhead transparency of an outline, these are the breadth and depth of media instruction in the programs of teacher education. The subject matter used for illustrative purposes in these courses is generally banal, a mere means of demonstrating technique rather than teaching anything of a conceptualized nature, for the instructor assumes that the teacher will learn which ideas or skills they want to develop in the academic or methods courses.

But this assumption is probably false. Few academic department use anything more complex than a record player or an occasional movie in their own instruction, and few, if any, offer any course within their own discipline on the structuring of content for media presentation. Many regard technology as a toy for teachers to use to entertain those too stupid to appreciate "the higher things." Few university instructors see technology as an instrumental aspect of the instructional process. Fewer still would accept the premise that to really know one's subject is to know how to use technology to teach it. The point is, today, only a few universities have considered the role of media and technology as being directly involved in the day to day matriculation of their student bodies.

A few imaginative teachers have been able to use the technology as it should be used, but for the most part, such things as closed-circuit television, dial-access system, video- and even audio-tape recorders have had their real functions misappropriated. College teachers have looked upon media strictly as labor savers or as methods of exposing more students to the same presentation. The net result has been that lectures, which may be boring or unstimulating to begin with, have become even more stultifying and impersonal. The technology has been used to widen the gap between student and teacher. They have been used to impersonalize instruction without necessarily making learning one iota more rational, and this has been especially true in the university departments of English, History, and the Social Sciences.

That technology is so rejected in the social aspects of education is highly ironic, for the machines of teaching are fundamentally devices of <u>communication</u>, not simply reproducers of the written or spoken word. They will communicate at many different levels, and to truly <u>use</u> the machines rather than merely operate them, perhaps some guidelines can be established regarding the communicative functions of machines to better fit them into the instructional process.

The following are four functions of machines in classroom activity:

1. Machines can emphasize aspects of teaching: Certain parts of the instructional process are static. These can be conceived as the <u>givens</u>, the things to be remembered, or the boundaries of study. Generally they are rank ordered by some sense of logic, and one major premise may contain several minor premises and several examples. By using color coding, differentiated sizing, dimensional effects, and schemata, teachers can develop systems of presentation which materially aid the student in conceiving the <u>logic structure</u> of the discipline,

possibly in several different ways.

2. Machines can portray dynamics: Certain aspects of the instructional process can be conceived as dynamic in nature. Under this aspect we would consider the operations of combination and synthesis or division and differentiation. The scope of these operations would range through the entire field of organized inquiry, from biological evolution to the character development of Holden Caulfield. Any process which changes shapes, properties or function in a predictable way can be graphically rendered in some way. Machines can slow down processes which escape the senses in their fleetness, or speed up those which grind with intolerable delay. Operations too small to notice can be enlarged and better comprehended. Things too large to comprehend can be reduced in size and scope. And technology offers us the wherewithal to accomplish it.

3. Machines portray emotions: Machines, especially media machines, offer us untold advantages in "humanizing" the sterile data. They enable teachers to reduce abstract conceptual generalization to human problems, complete with the emotional expressions which extreme tensions arouse. Pathos, sympathy, pity, humor, and fear are powerful, very powerful, learning devices, and yet, how many students have ever really been moved by the failures of Marcus Aurelius, the dilemma of Cicero, or the resignation of Tiberius Gracchus? The whole range of emotion is immediately accessible to the classroom, and most schools have the human resources to use them well with proper direction. Whether media presentations use professional actors or student productions, media creates the common denominator for emotive comparison, and the power to move is the power to inspire.

4. Machines can involve people in activities: Machines offer us a chance to see and hear our favorite people, ourselves. They enable people to seriously analyze in retrospect their own role, and their role in relationship to others. And these machines will produce again and again a very finite series of actions so that each succeeding level of behavior is available for analysis. School behavior, socialized behavior, intellectual behavior, psychological behavior, all are there to be seen again and again. Technology, in the hands of the adroit, makes each lesson a triple lesson or even a quadruple lesson. However, the proper evaluation of actions requires more training than most of us possess.

Like all other machines, the machines of education enable us to rationalize our activity. Many teachers tend to fear machines. They visualize an automated classroom where cybernetics have replaced teachers and the educative process turns out conditioned automatons, responding on cue to the right stimulii and receiving the proper reward for appropriate actions. This would be the case <u>if people were programmed instead of data</u>. To make data rational, to make learning systematic is not to make it unhuman. Machinery simply makes us rationalize those behaviors which can be systematized. This frees the teacher for his real job, the job of humanizing the material and attacking the value problems of a generation in turmoil. Where reasoned activity is lacking and when there are no established criteria for judgment of appropriateness, then there is tyranny. The machines can help teachers do rationally those things which they should do reasonably, and to <u>use</u> the machine, rather than merely operate it, is to be aware of the reason for, and the rationale of, our teaching.

The crux of the problem is the understanding of the true nature of

technology. Technology offers us a new perspective on the problem of the structure of learning, and the ability to utilize the technology will correlate highly to the teacher's ability to define purposeful activity, activity which is systematic, rational, and meaningful. The criteria for judging the purpose of classroom activity will be derived, of course, from two sources: the discipline structure of the subject area and the human needs of the learners. As these are molded into process descriptions and behavioral or performance criteria, so the specific purposes of the technology are defined at the activity level. "Program" becomes the logic and method of taking a learner from point X to point Y, and technology becomes the means of mapping the X - Y path.

To illustrate this point, one has but to look at the average football coach in either high school or college. While he does not possess any greater intellectual abilities than most of his colleagues possess, yet he is a master at the application of technology. The video taper, movie camera, and exerciser hold no mystery to him. He can tell you exactly where each fits into his instructional program, and he can demonstrate the proper use of each machine in terms of the purposeful activity. He knows what is appropriate for what machine; he would never order his players into the whirlpool bath prior to a scrimmage without a very special reason. He used the video-tape recorder for taping conditioning drills. As a matter of course, he systematically uses thousands of dollars worth of technological equipment without a second thought.

The football coach uses equipment well because he exactly understands the nature of his task. By understanding the nature of the discipline (the rules governing the game of football) and the needs of learner (in terms of physical

abilities, understandings, and specific skills) he is able to use the functions of the machine to produce the desired affect in the skills, understandings, or physical abilities of his players. He sees the equipment as an embodiment of a logical program designed to bring about a given desired effect, and therefore, he uses it well. To develop this kind of functional ability among teachers of all subjects is the problem of teacher education, and it calls us back again and again to the problem of defining purposeful activity, and it forces us to consider the conditions and restraints which limit a full scale move by education into the age of technology.

## BOUNDARY CONDITIONS FOR CHANGE

Certain boundaries or limitations on the purposeful exploitation of technology now exist in the bureaucratic and value systems of education. Therefore, any recommendations or innovations must be derived from consideration of these boundaries. To solve the problem of technology and education, one must penetrate the wall of values and procedures which now insulate the present educational system from the forces of technological change which dominate progress in other spheres of institutional activity in the U.S.

These boundaries exist on two major levels. Level one consists of the value and procedural configurations which make up the teacher training institutions. Specifically, this problem subdivided into two major areas of activity -- deans and administrators, and faculties of teacher training institutions. Level two is the general area of the public school itself, and this subdivides into three major boundary areas: 1) the administration and the support staff, 2) the faculty, and 3) the community. To bring about change in these levels, one must change the configurations of values and procedures

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within the areas.

In dealing with these levels, one can delineate the following boundaries or perameters which now block the road of technological evolution in education:

A. Boundaries in Teacher Education

1. Deans and Department Heads, those who supervise and evaluate teacher trainers, put a low premium on technology in their own outlooks on teaching role. They themselves do not use it effectively, nor do they deem it important that their teachers use it effectively.
2. There are a lack of funds for use in implementing technology in teacher education. Expenditures for educational technology are a small fraction of expenditures on military technology, and until new sources of funding are found, it will be difficult for technology to become a routine aspect of classroom activity.
3. Professors and instructors, who train teachers, treat teaching like an art. Much of the content is vague, "how to do it," prescriptions. Too much of it is folklore, with the addition of a little behavioral science about the nature of the learner, and phenomenological experience.
4. Teacher educators are in a key position to affect what happens in the American classroom. They become models for their students of instructional technique. Frequently, however, the teacher educators give more attention to writing and research than teaching. In this, they are adhering to the ethos of the university. Since instructional technology has little place in university teaching (or so the ethos would dictate), teacher educators find no compelling reason to use it.

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Frequently, they are in the awkward position of urging their students to use media while never using it in their own teaching. Teacher educators have not defined the skills and performances that are expected of a teacher. The frequent result is that they teach no teaching skills. Performance criteria and objective norm levels would much enhance the use of technology in teacher training.

5. Funding, the problem of obtaining financial resources, is present at each level of the problem. The problem of funds is an instructional problem as well as an administrative problem, and the needs are the same.

B. Boundaries in In-Service and Pre-Service Training of Teachers

1. Like deans and department heads in teacher training institutions, administrators and supervisory personnel put little priority on exploitation of technology in their own presentation of problems and explanations of administrative decision making. They rely on words to convey ideas which could be better presented through media tools.

2. They fail to put a high priority on media utilization in their evaluations of staff. Administrators do not generally base their evaluations and recommendations or their assignment of teaching personnel upon criteria of technological proficiency. No skills or basic proficiencies are defined which teachers may use as performance goals in evaluating their own teaching.

3. Communities fail to appreciate the role of technology. Too often, if administrator attempts to develop a good media program in the school, the community tends to regard it as a "frill" or a luxury which increases tax load without improving the "product." Communities have to be educated to the fact that technology does better and faster many of those

things which they expect schools to do. Learning can be interesting and still be learning.

4. Teacher's professional autonomy is rising, and administrators may be unable to effect change in the traditional manner in the future. Teachers are now becoming more inclined to think of administrators as facilitators rather than decision makers and instruction leaders, so an administrator may be highly motivated toward technology, but lack the real power to actually change behavior patterns.
5. Teachers vary tremendously in experience, competence and attitude. Training problems are different for new teachers as opposed to experienced teachers. New teachers may be lacking in security over the basic aspects of teaching (discipline, social relationship and image), while experienced teachers may be affected by too much security.
6. Subject matters differ in adaptability to technology. Some subjects such as sciences, hygiene, drivers' training and business education lend themselves much more to technology than do highly expressive media such as arts, literature, and drama. Therefore, if there were an articulated evaluative program for teachers' ratings, a weighted scale would have to be devised for evaluation.
7. Heavy demands are now made against teachers' time. Little time is appropriated in the teachers' day for improvement of instruction, and knowledge of subject matter demands so much extra preparation during vacations and holidays. Little time is left, nor is there much incentive professionally or momentarily for improved development of technological skills.
8. Any program to substantially improve the use of technology by teachers

must contend with the "loser image" which teachers presently have of technology. In the past, it has been over-sold. Improvements have been promised in the educational journals and popular press (e.g., programmed learning) which have never materialized. There are few teachers who have not been embarrassed by the projector which at the crucial moment breaks down. Therefore, what is done to improve the use of advanced technology by teachers should be based on a reliable future.

The Guidelines for Change

Although it is crucial that the teacher understands the role of technology and their relationship to instructional technology, understanding alone is not enough. Change is needed in the attitudes and behavioral repertories of individual educators. Institutions, too, need to be restructured to accommodate innovations. In a chapter of the 1957 NSSE Yearbook, In-Service Education, Herbert Coffey and William Golden offered several principles from the psychology of change which may shed light on our problem. Although Coffey and Golden are referring specifically to change within institutions brought about through in-service training, many of these principles hold true for changing the faculties of pre-service teaching training institutions too.

> First, the individual is motivated to change when there is a disequilibrium between the tension systems of the individual and the surrounding social field. The dynamics of the process of change are seen in the attempts to restore equilibrium with the individual or to change the tensional quality of the surrounding social field.[3]

If teachers and administrators are to change their attitudes toward instructional technology and prepare to change their behavior, their normal equilibrium must be disturbed. Something must upset the balance and cause tension

[3]Coffey & Golden, In-Service Education, p. 99.

to develop. They must begin to feel dissatisfied with what they are currently doing. Next, they should see instructional technology as a means of alleviating the new tension.

> Second, in addition to needs growing out of physiological processes, many human needs are determined by the group to which one belongs or the status to which one aspires. Behavior which is characteristically human is most often in response to tensions arising in the field of social relationships.[4]

This principle reflects the human tendency to want to copy, or model ourselves after, those we like and admire. Also, it reflects the individual's tendency to seek to acquire the knowledge, skills, and behaviors of the social group to which he aspires. The prospective teacher feels tension until he has acquired the skills of the teacher. The admired faculty member becomes a model for his colleagues. While this principle can be a constructive force for change, it also explains the very conservative nature of teaching methodology.

> Third, the process of psychotherapeutic change comes about under conditions where the perceived needs of the patient are made the focus of attention, where the threats to one's perceptions are reduced, and where the relationship of therapist and patient are mutually collaborative. These are aspects of changed situations which can be generalized to any situation.[5]

This principle reminds us that those concerned with change must not overlook the needs of the individual. The individual, in this case, is the teacher or the administrator. Before he is to change, he must not only develop dissatisfaction with things as they are and develop a new level of aspiration for himself, but also he must see change as satisfying some of his needs. He must see that he is able to make the change, and that the goal is, indeed, attainable. The proposed change must be perceived as being helpful to him. The teacher or administrator must see that change is making him a more effective or happier individual. This factor is frequently overlooked. Often changes advocated that will make other people happy, but not those who are called upon to do the

[4] Ibid.
[5] Ibid. p. 100

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changing. This is particularly true of administrators who are in a position to see the need for change. They, then, insist or urge that their teachers change without particular regard to the affective consequences for their teachers.

> Fourth, individual behavior within a social system is determined by the role which is prescribed by that system. Roles contribute to the functioning of the system by creating within the individual highly internalized expectancies as to how he should behave and how others will behave. Role behavior becomes highly fixed within the institution and is disrupted only under rather extreme conditions.[6]

Before any significant change in the behavior of administrators and teachers will be effected, their roles must be changed. This is the heart of the problem. At present, the role of the teacher requires a low level of competence in the manipulation of instructional technology. The expectancies of both the school professionals and the members of the larger community are few and vague. For real change in instructional behavior of school personnel to take place, a massive effort must be made to reshape, or perhaps recast the expectancies of teachers, so that new roles emerge which involve the informed and skilled use of instructional technology. The performance of these new roles must become the expectancy of school men and non-school men alike. Some of the means for this massive effort will be discussed later.

The school administrator is the individual who controls a major portion of the rewards and sanctions for his teachers. Change can be encouraged if the administrator uses his rewards and sanctions in the right way. Teachers must be encouraged to acquire the understanding of instructional technology and the related skills. Without the support and involvement of the administrator, whether he be dean of the school of education or principal of a small elementary school, a major portion of the incentive needed for change will be lacking.

[6] Ibid, p. 101

> Fifth, the most significant barrier in institutional change is the resistance which persons express when such change seem threatened to roles in which they have developed considerably security. When the process of institutional change is facilitated by a number of conditions; a) when the leadership is democratic and the group members have freedom to participate in the decision-making process; b) When there have been norms established which make "social change" an expected aspect of institutional growth; c) When change can be brought about without jeopodizing the individual's membership in the group; d) When the group concerned is a strong sense of belongingness, when it is attractive to the members, and when it is concerned with satisfying member needs; e) When the group members actively participate in the leadership functions, help formjlate the goals, plan the steps toward goal realization, and participate in the evaluation of these aspects of leadership; f) When the level of cohesion permits members of the group to express themselves freely and to test new roles by trying out new behavior attitudes without being threatened by "real consequences."[7]

The particular set of concepts clustered above refer especially to experienced teachers and teacher educators -- the people who will be most threatened by a major role change. Since most will feel that they have already mastered the knowledge and skill of their profession, considerably skill and energy will be necessary to help them move into new areas. Beginning teachers in pre-service training, on the other hand, will not be as resistant to training. The problem is more complex for the experienced personnel because it means not only learning new skills and behaviors, but extinguishing old skills and behaviors. Also, for many experienced teachers, the change to a more sophisticated use of educational technology will mean drastically revising the way in which they conceptualize their role as teacher. The set of concepts above focuses particularly on the setting and dynamics of the training situation. Instead of having training thrust upon them, professionals should be given a choice. For a significant behavior change to occur among this group, the training must affect their minds and their hearts. Therefore, instead of directing professionals to undergo training, it should be presented as a valuable, attractive possibility. They must know that their efforts, however amateurish, to use instructional technology

[7]Ibid, p. 101-2.

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will be supported within their institution. As far as possible, they must have the security that their efforts to use advanced technology in the classroom will not separate them from valued peers. While every effort should be made to make the group training a rewarding social experience, there should be some opportunity for individual creativity on the part of the trainees. Frequently training experiences are highly standarized and allow for little human ingenuity or creativity. To get deep commitment and real involvement on the part of school personnel, there should be opportunities in this training for the expression of creative self.

> Sixth, any change within a given group must be supported by the organizational structure lest it become the storm center of ideological conflict within the institution. Therefore, communication must flow one hierarchical level to another. For a change must be sanctioned within the social structure. Resistance to change is to be expected at any level.[8]

Schools are complex social phenomena and are becoming more so all the time. If change is to take place in the school, many levels of the hierarchy need to be involved. Also, since change is disruptive by nature and threatening to many, it has great potential for generating conflict. It is important, therefore, that planning involves people from many levels within the hierarchy. Even if we are essentially talking about changing the behavior pattern of classroom teachers, it is essential that change has the support of, or at least no resistance from, the Board of Education, the PTA, the teacher union or professional organization, the administration, the administrative staff, supervisors, and more recently, student governments. Unilateral action is potentially disruptive in the interdependent life of the school.

## INSTRUMENTATION

If administrators and teachers are to acquire the understanding and

[8] Ibid, p. 102.

competencies necessary to use the more advanced instructional technology, the present system for initial and pre-service teacher training must be altered. The teacher training system can be altered at many different points. First, the complacency with the status quo must be disturbed and tension introduced. Second, a means for easing tension and acquiring a new level of equilibrium must become known. Third, the training, which actually brings about the new equilibrium, must be made available. Fourth, the new level of equilibrium must be recognized as legitimate and be rewarded. The concrete suggestions which follow are based on this four-step rationale.

The Introduction of Tension

1. Educators and those who support the schools and teacher training institutions (i.e., the public) must be convinced of the low state of instructional technology in the schools, and, also, what is possible. The mass media can play an important role here. Books, magazine articles, and, especially television, should be used to dramatize the disparity between what is and what could be. Hopefully, this exposition will not be an exposé. Administrators, teachers and teacher educators should not simply be of the targets of criticism. An honest, sympathetic picture of the state of instructional technology in the schools will probably do more good in the long run than an attack, which may arouse anger and guilt.
2. Educators can look to industry and industrial training as guidelines for expenditures on retraining. When an industry re-tools for a new process, they commit vast resources to the problem in anticipation of reward. The fruits of this commitment have been borne out enough times to convince them that it is good business to re-tool and retrain, even if it means very sizeable capital expenditure. This lesson has been lost on education.

To remedy this, teacher training institutions must get industry to present its approaches to problem solving through training and retooling to the public via the commercial media-television, periodicals, newspapers and radio. The cost of this to the public will be ultimately reduced if we can better fit the educational programs to the real needs of the learners. Riots, welfare programs and social service use more money than the cost of a first rate educational program, and industry has the image, the reputation, and the "know how" to sell this program to the public.

2. Exemplars of the sophisticated use of instructional technology should be made highly visible. While the NASA program and certain industrial training programs can provide startling examples of the advanced use of instructional technology, the heavy reliance on examples outside public education may just add to the "credibility gap." Prototypes within the public schools and teacher education need to be developed and publicized.

3. The professional organizations, like the American Association of Colleges of Teacher Education and the American Association of School Administrators, should be enlisted in a major effort to upgrade the use of instructional technology. The levers of influence and power within the profession should not be put on the defensive, but made part of the offense.

Directions for Reducing Tension

1. Educators must be made aware that sophisticated instructional technology is available for their schools and that training in the utilization of technology is also available. To accomplish both of these ends, new sources of funding will undoubtedly have to be discovered.

2. Boards of education and administrative officers within universities must be

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asked to support the training effort directed at teacher educators, administrators and teachers both in allocation of finances and time.

3. A film of extremely high quality on the use of instructional technology should be made. This film should be directed to the education community (teacher educators, boards of education, administrators and teachers). The film should not only deal with what is and what could be, but point the available means by which faculties can gain access to training. This film may show a lesson (or several lessons) presented in two different manners. The first approach may be a traditional lecture by a very good lecturer, and it would deal with a standard lesson which one may find being taught in almost any high school. The second approach would take the same content but it would use several types of media to dramatize the points and to map the processes put forward in the subject matter. The rationale for this presentation would be to show teachers and administrators that media will do better those things from which they already deem important. The film may conclude with a series of scenes from media centers, along with locations of these cites, where teachers may obtain help and assistance for their own projects.

Training Programs

1. Since industry will directly and indirectly benefit from the use of advanced technology in the schools, it should take on major responsibility for developing training programs. However, professional organizations should be consulted in the design of these training programs. It is quite conceivable that special agencies for training which combine the best efforts of the industrial and education community need to be instituted.

2. Teacher trainers should be the primary target for training programs in instructional technology. Since they control the source of the profession, they could be the leaven for the profession. Therefore, teacher educators should receive intensive training and support in the use of the new media.
3. Since public school administrators still largely control the reward system, they are a most potent force for change in the schools. Therefore, they should not only receive intensive media training, but also their training should include methods of stimulating faculty in the use of media. If teachers are unable to procure the films, tapes, records, or other materials which they want at the times when they are most desired, this will tend to extinguish any motivation they have for using technology on the part of the teachers. As part of their training, they should receive instruction in systems of facilitating procurement of media by teachers.
4. There should be a variety of training programs designed to meet the needs of the different trainee groups. The skills and competencies needed by the Dean of the School of Education in this area are quite different from those needed by a third grade teacher.
5. Selection for training should not only be voluntary, but somewhat competitive. If an entire teacher education or public school faculty is pressed into training, there will be resistance. If only one or two from a faculty are trained, they could end up prophets without honor within their own schools. Therefore, a small group of administrators and teachers from an institution should be chosen for specialized training. Once the training makes a positive difference in their teaching, others will request training.

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5. The training program itself should involve the most sophisticated use of instructional technology. The message and the medium should be mutually reinforcing.
6. The training program should allow for an immediate payoff for the trainee. Specifically, teachers and administrators should be able to identify and develop materials for their own use as soon as they return to their school.
7. Although a training program should be directed by behavioral objectives and clearly identified levels of performance, there should be opportunities for creativity on the part of the trainees. Trainees should not simply be on the receiving end.
8. Special time and special financial reimbursement should be made available for those who undergo training.
9. Training programs should have a follow-up in the schools so that skills and competencies are maintained.

A System of Rewards

1. Although the use of instructional technology must be intrinsically rewarding, the development of a high level of technology in the school will undoubtedly require the use of special rewards. Teachers and administrators who are innovative in the use of technology or who perform at special levels of competence, should be given special recognition in the form of national awards, money prizes, and public acknowledgments.
2. Eventually, the new competencies in skills required of teachers, administrators and teacher educators should become part of their normal and expected skills and competencies.
3. As part of the reward system, perhaps those who manufacture the media machines would sponsor an award or a series of awards to teachers and systems which

successfully developed media programs. In order to prevent commercialism of the reward system, however, professional educational organizations should probably supervise and make final decisions on the recipients.

## CONCLUSION

Of the major professional groups, there is probably none that is as under-trained as teachers. For this very reason, teachers and administrators will be responsive to relevant, superior training, especially if it helps them to perform their daily work with a greater competence and sense of achievement. It is quite conceivable that a quantum jump can be made in the use of technology if our on-the-cheap approach to the training of teachers is abandoned. In a sense, teacher educators, administrators and classroom teachers are so hungry for ways to improve their professional skills, that they could be captured by relevant and powerful training programs.